2. A method according to claim 1, in which the writing light beam is [polarised] polarized in a direction substantially perpendicular to the axis of the section of the optical [fibre] fiber.

3. A method according to claim 1 [or claim 2], in which the writing light beam is an ultraviolet beam.

4. A method according to claim 3, in which the ultraviolet beam has a wavelength of about 244 [nanometres] nanometers.

A1 cont'd

5. A method according to [any one of claims 1 to 4] claim 1, in which the optical [fibre] fiber section is doped with at least one amplifying dopant.

6. A method according to claim 5, in which the optical [fibre] fiber section is doped with at least one rare earth element.

7. A method according to claim 6, in which the optical [fibre] fiber section is doped with erbium and ytterbium.

8. A method according to [any one of claims 1 to 7] claim 1, wherein the optical [fibre] fiber laser is stressed to provide substantially single [polarisation] polarization operation.

9. A method according to [any one of claims 1 to 7] claim 1, wherein the optical [fibre] fiber laser is stressed to provide dual [polarisation] polarization operation.

10. A method according to [any one of claims 1 to 8] claim 1, wherein the grating structure is written as a Moire phase shifted structure to provide lasing operation at two wavelengths having one [polarisation] polarization.

11. A method according to [any one of claims 1 to 8] claim 1, wherein the grating structure is written as first and second overlaying DFB grating structures to provide lasing operation at two wavelengths having one [polarisation] polarization.

A1 cont.

12. An optical [fibre] fiber laser comprising an optical [fibre] fiber having a grating structure in a section of the optical [fibre] fiber, wherein the grating structure has a different grating strength for two orthogonal [polarisation] polarization modes of the optical [fibre] fiber, the grating structure comprising a discrete phase shift which is substantially identical for the two orthogonal [polarisation] polarization modes.

13. An optical [fibre] fiber laser according to claim 12, in which the optical [fibre] fiber section is doped with at least one amplifying dopant.

14. An optical [fibre] fiber laser according to claim 13, in which the optical [fibre] fiber section is doped with at least one rare earth element.

15. An optical [fibre] fiber laser according to claim 14, in which the optical [fibre] fiber section is doped with erbium and ytterbium.

16. An optical [fibre] fiber laser according to [any one of claims 12 to 15] claim 12, wherein the optical [fibre] fiber laser is configured to provide substantially single [polarisation] polarization operation.

17. An optical [fibre] fiber laser according to [any one of claims 12 to 15] claim 12, wherein the optical [fibre] fiber laser is configured to provide dual [polarisation] polarization operation.

A1 cont.

18. An optical [fibre] fiber laser according to [any one of claims 12 to 15] claim 12, wherein the optical [fibre] fiber laser is configured to provide dual wavelength operation having one [polarisation] polarization.

19. An optical [fibre] fiber laser according to claim 18, wherein the grating structure is a Moire phase shifted structure having one [polarisation] polarization.

20. An optical [fibre] fiber laser according to claim 18, wherein the grating structure comprises first and second overlaying DFB grating structures.

21. An optical phase conjugator comprising:

one or more in-line optical [fibre] fiber lasers [according to any one of claims 12 to 20] for generating two substantially orthogonally [polarised] polarized pump light beams, each in-line optical fiber laser comprising an optical fiber having a grating structure in a section of the optical fiber, wherein the grating structure has a different grating strength for two orthogonal polarization modes of the optical fiber, the grating

structure comprising a discrete phase shift which is substantially identical for the two orthogonal polarization modes; and

a non-linear mixing waveguide for receiving and mixing the pump beams with an input signal beam.

22. A phase conjugator according to claim 21, in which the non-linear mixing waveguide is selected from the group consisting of: a dispersion-shifted optical [fibre] fiber; a chalcogenide optical [fibre] fiber; and a semiconductor optical amplifier.

A1 Cont.

23. A phase conjugator according to claim 21 [or claim 22], in which the two pump beams have wavelengths displaced to either side of the wavelength of the signal beam.

24. A phase conjugator according to [any one of claims 21 to 23] claim 21, in which the one or more in-line optical [fibre] fiber lasers comprise:

a first single [polarisation] polarization optical [fibre] fiber laser [according to claim 16];

a [polarisation] polarization controller for varying the [polarisation] polarization of a light beam generated by the first single [polarisation] polarization optical [fibre] fiber laser; and

a second single [polarisation] polarization optical [fibre] fiber laser [according to claim] connected in series with the first single [polarisation] polarization optical [fibre] fiber laser and the [polarisation] polarization controller,

wherein each of the first and second single polarization optical fiber lasers comprises an optical fiber having a grating structure in a section of the optical fiber,

wherein the grating structure has a different grating strength for two orthogonal polarization modes of the optical fiber, the grating structure comprising a discrete phase shift which is substantially identical for the two orthogonal polarization modes.

25. A phase conjugator according to [any one of claims 21 to 23] claim 21, in which the one or more in-line optical [fibre] fiber lasers comprise:

a dual [polarisation] polarization optical [fibre] fiber laser [according to claim 17] comprising an optical fiber having a grating structure in a section of the optical fiber, wherein the grating structure has a different grating strength for two orthogonal polarization modes of the optical fiber, the grating structure comprising a discrete phase shift which is substantially identical for the two orthogonal polarization modes.

A1 cont.

26. A laser source comprising:

a single [polarisation] polarization, dual wavelength laser [according to claim 18] having two output wavelengths and comprising an optical fiber having a grating structure in a section of the optical fiber, wherein the grating structure has a different grating strength for two orthogonal polarization modes of the optical fiber, the grating structure comprising a discrete phase shift which is substantially identical for the two orthogonal polarization modes;

[means] a device for detecting and monitoring a beat frequency between the two output wavelengths of the laser; and

a feedback circuit operable to control the two output wavelengths of the laser to keep the detected beat frequency substantially constant.

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Respectfully submitted,

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CERTIFICATION UNDER 37 CFR 1.10

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